

This listing of claims replaces all prior versions of claims in the Application.

Listing of Claims

Claim 1. (Previously Presented) A method for determining the quantity of both brightener and leveler in an electroplating bath having an unknown quantity of brightener and leveler comprising the steps of:

- a) determining the amount of brightener in the electroplating bath having the unknown quantity of brightener and leveler by a method selected from cyclic voltammetric stripping and cyclic pulse voltammetric stripping;
- b) obtaining a plurality of plating baths where each bath has a known and different quantity of said brightener and leveler, but where the quantity of each in each bath differs from the quantity in the other baths;
- c) for each bath, providing a counter electrode, a cleaned working electrode and a reference electrode immersed in said bath, and carrying out a predetermined sequence of steps comprising:
 - 1. cleaning and oxidizing the surface of the working electrode at a fixed potential for a period of time;
 - 2. equilibrating said working electrode to absorb brightener according to a step selected from equilibrating without energy input for a time until the change in energy output with time is minimal and equilibrating for a set time at a fixed potential;
 - 3. plating metal ions on said working electrode with energy input for a time selected from a time sufficient to measure initial plating energy output and, a time sufficient to measure the change in energy output with time; and
 - 4. stripping at a potential and for a period of time sufficient to remove the metal ions plated in step 3;
- d) for each bath, correlating the quantity of leveler with the energy output value obtained in step 3;

e) placing said electrodes in said electroplating bath having the unknown quantity of brightener and leveler and performing said predetermined sequence of steps;

f) choosing from said correlations in step d), a particular correlation for a bath containing substantially the amount of brightener determined in step a); and

g) choosing from the particular correlation in step f), a quantity of leveler which corresponds to said energy outputs recorded for said electroplating bath having the unknown quantity of brightener and leveler.

Claim 2. (Original) The method of claim 1 wherein the electroplating bath is a copper electroplating bath.

Claim 3. (Original) The method of claim 1 wherein the working electrode is a platinum electrode.

Claim 4. (Original) The method of claim 1 wherein the electrode is a rotating disk electrode.

Claim 5. (Previously Presented) A method for determining the quantity of both brightener and leveler in an electroplating bath having an unknown quantity of both brightener and leveler comprising the steps of:

a) obtaining a plurality of plating baths, where each bath has a known and different quantity of said brightener and leveler, but where the quantity of each in each bath differs from the quantity in the other baths;

b) sweeping for each of said baths an inert, working electrode at a predetermined rate through a plurality of voltammetric cycles until a condition of steady state is obtained, each of said voltammetric cycles including a metal plating range and a metal stripping range for each of said baths of said plurality of baths, each of said voltammetric cycles comprising a sweeping of a voltage toward one polarity followed by a sweeping of said voltage toward a reverse of said one polarity to complete said cycle;

c) measuring the coulombs utilized during said metal stripping range of said cycle for each of said baths of said plurality of baths, whereby a correlation is obtained between the effective quantity of brightener and said coulombs utilized during said metal stripping range;

d) providing the electroplating bath having the unknown quantity of both brightener and leveler;

e) sweeping for said bath having the unknown quantity of both brightener and leveler an inert, working electrode at said predetermined rate through a plurality of voltammetric cycles until a condition of steady state is obtained, each of said voltammetric cycles including a metal plating range and a metal stripping range for said electroplating bath having the unknown quantity of both brightener and leveler, each of said voltammetric cycles comprising a sweeping of a voltage toward one polarity followed by a sweeping of said voltage toward a reverse of said one polarity to complete said cycle;

f) measuring the coulombs utilized during said metal stripping range of said cycle for said electroplating bath having the unknown quantity of both brightener and leveler;

g) choosing from said correlation a quantity of brightener which corresponds to said coulombs utilized for said electroplating bath having the unknown quantity of both brightener and leveler;

h) for each of said plurality of plating baths in step a), providing a counter electrode, a cleaned working electrode and a reference electrode immersed in said bath, and carrying out a predetermined sequence of steps comprising:

1. cleaning and oxidizing the surface of the working electrode at a fixed potential for a period of time;
2. equilibrating said working electrode to absorb brightener according to a step selected from equilibrating without energy input for a time until the change in energy output with time is minimal and equilibrating for a set time at a fixed potential;
3. plating metal ions on said working electrode with energy input for a time selected from a time sufficient to measure initial plating energy output and a time sufficient to measure the change in energy output with time; and
4. stripping at a potential and for a period of time sufficient to remove the metal ions plated in step 3;

- i) for each bath, correlating the quantity of leveler with the energy output value obtained in step 3;
- j) placing said electrodes in said electroplating bath having the unknown quantity of both brightener and leveler and performing said predetermined sequence of steps;
- k) choosing from said correlations in step i), a particular correlation for a bath containing substantially the amount of brightener determined in step g); and
- l) choosing from the particular correlation in step k), a quantity of leveler which corresponds to said energy outputs recorded for said electroplating bath having the unknown quantity of brightener and leveler.

Claim 6. (Original) The method of claim 5 wherein the electroplating bath is a copper electroplating bath.

Claim 7. (Original) The method of claim 5 wherein the working electrode is a platinum electrode.

Claim 8. (Original) The method of claim 5 wherein the electrode is a rotating disk electrode.

Claims 9-12. (Canceled)